

Finding Vertex of a Parabola

Maximum or Minimum value

- From vertex form: $y = a(x-h)^2 + k$

Vertex is (h, k)

- From standard form: $y = ax^2 + bx + c$

$$x_{\text{of vertex}} = \frac{-b}{2a}$$

Plug that x back into $y =$

Ex: $f(x) = x^2 - 4x + 3$

$\rightarrow a=1 \quad b=-4 \quad c=3$

$$x = \frac{-b}{2a} = \frac{-(-4)}{2(1)} = \frac{4}{2} = 2 \rightarrow \text{vertex is } (2, ?)$$

plug $x=2$ into eq:

$$f(2) = 2^2 - 4(2) + 3$$

$$= 4 - 8 + 3 = -1 \rightarrow \text{this is the } y\text{-value of vertex}$$

vertex $(2, -1)$

Ex 2: $f(x) = 2x^2 + 8x - 5$

$\rightarrow a= \quad b= \quad c=$

$$x = \frac{-b}{2a} =$$

$$f() =$$

vertex (\quad , \quad)

Is the Vertex a Max or Min?

- Positive a-value → happy opens up



Since the vertex is at the bottom, it's the lowest point or Minimum value

- Negative a-value → sad opens down reflected



Since the vertex is at the top, it's the highest point or Maximum value

Practice

- Determine whether each function has a Maximum or Minimum value.
- Find the Max or Min value (vertex).

1) $f(x) = x^2 + 6x - 2$

2) $f(x) = -x^2 - 9$

*careful!

3) $f(x) = 3 - x^2 - 6x$

4) $f(x) = x^2 - x - 6$

5) $f(x) = \frac{3}{4}x^2 - 5x - 2$